B 20K

High-performance welding control system for resistance welding processes

BIHLER

Bihler core competence welding

1968
First Bihler welding application

1974
Development of S3 welding control system (AC) and first contact welding unit

1983
Development of B 10 welding control system (three-phase current/ DC)

1992
Development of B 1000 welding control system (inverter control, medium frequency)

2002
Development of B 5000 welding control system (inverter control, medium frequency)

2013
Development of B 5000-NC Application progressive technology / presses

2016
1400 welding controllers
2400 welding tools
7000 feasibility studies

2017
Development of B 20K welding control system (inverter control, high frequency)

B 20K
Features

Process frequencies of up to 20,000Hz

Compared to low process frequencies, the higher process frequencies allow for even more adjustment options to apply the energy required for the welding process metered and targeted. This leads to higher quality and an extended range of welding applications.

100% protection from power fluctuations

The standard active power supply module offers protection from power fluctuations. The active power supply module provides a separate supply voltage for the inverter independent of the mains voltage. This means the inverter supply is independent of mains voltage drops and fluctuations and maximum process reliability is guaranteed.

Maximum process transparency

Five standard measuring channels for logging welding process data are integrated in the B 20K. Measuring curves and measured values can be used for closed-loop control, process monitoring and diagnostic functions and provide all options required for a reliable and transparent welding process.

Quick welding profile manipulation during production

Automatically with a stepper function that changes the welding profile after a defined number of welds. Manually with the quick online parameter adjustment feature. In both cases, there is no machine downtime and the welding parameters can be identified, adapted and optimized quickly.

Contactless heating by induction annealing

The B 20K provides compatibility to integrate an inductor (instead of the welding transformer). With an inductor, steels and non-ferrous metals can be heated contactless.

Control of NC axes

In addition to the process, measuring and monitoring functions, servo-controlled movements for welding applications can be easily implemented in the B 20K. Motion sequences for the welding tool are now performed independently by the welding control system and can be integrated into all existing production systems.

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Areas of application

From micro to macro welding

Wire diameter 0.02mm

Wire diameter 10mm

All resistance welding processes...

Resistance butt welding

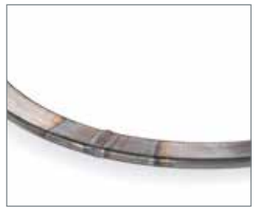
Projection welding

Contact welding

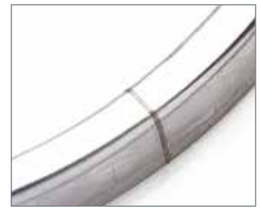
Silver graphite welding (AgC)

Resistance soldering

Compacting strands



Annealing



Mash seam welding

...with one single welding control system

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Welding system overview

Energy efficiency

The active power supply module for the welding voltage reduces the grid load by up to 50%, since the energy required for welding is provided by a separate voltage supply.

Control and monitoring

Each measuring channel can be combined with limits and/or control and monitoring functions to guarantee optimum process control.

Optional integration of servo axes

Ability to upgrade with servo axes for welding tool movement. This allows for an independent, flexible and optimum integration of movements in the welding process.

Optimum process data logging

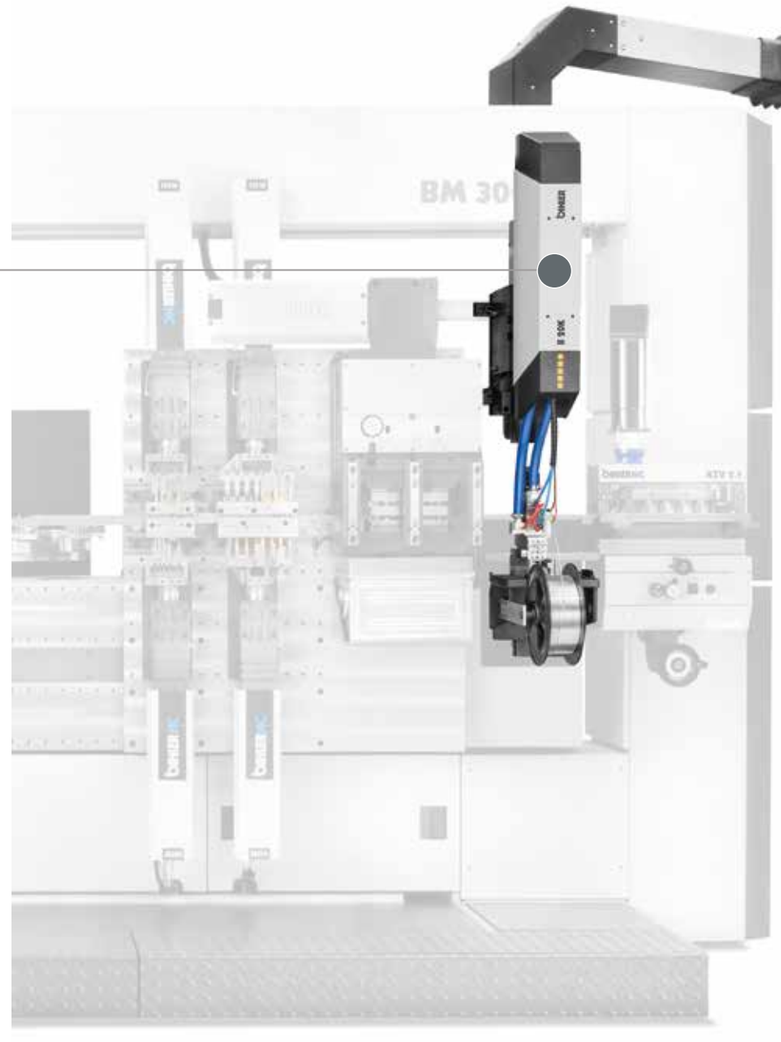
Measuring channels for current, voltage, distance, force as well as an additional measuring channel for controlling the welding process, process control and evaluation of the welding processes.

Welding data transfer

Networking capability via an OPC-UA interface for online data transmission of measured values, process monitoring and logging at part level.

Induction annealing for contactless heating can be integrated in the B 20K

Instead of the welding transformer, an inductor is connected. In the active area of the inductor, steels and non-ferrous metals can be heated contactless.



Optimum process control

Choice of different control modes for current or output control according to individually created welding profile or after reference weld as master curve for optimum welding process reliability.

Unlimited possibilities for welding tasks

Each profile section can be programmed individually with values for current or output, time and frequency. This allows unlimited possibilities to manipulate the welding task.

20,000Hz high-frequency technology

High-frequency technology provides an even more dynamic and finer control compared to low-frequency technologies for even better welding results.

Control system improvement

The highly dynamic control routines for current and output profile control provide the B 20K with improved control features compared to the previous models B 1000 and B 5000.

Independent from power fluctuations

The active power supply module generates a separately regulated, internal welding voltage for reliable operation.

Cooling system communicates with B 20K

Cooling system states are recorded by the B 20K. This ensures an optimum process.

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Versions

Version 1: B 20K

Stand-alone with touchscreen operation and keyboard on the control cabinet. The standard version includes 2 welding positions. Extensions with a maximum of 8 welding positions are possible with additional cabinets. This version provides compatibility with the B 1000 and B 5000 welding control systems. Input and output functions are possible without programming. The variety of applications for the stand-alone version ranges from integration in production and manufacturing systems to replacing existing B 1000 and B 5000 welding control systems.

2 welding positions | **+2** welding positions | **+2** welding positions | **+2** welding positions

Version 2: B 20K-NC

Stand-alone with NC control for welding tools. Can be integrated in an existing machine or an existing production system. In doing so, the B 20K is extended with additional axis cabinets. Application for integrating welding tasks with progressive equipment under a press. This allows for the integration of welding tool movements independent of a fixed press stroke. Faster process times, no bounce behavior of the press head, reduced electrode wear and simplified integration compared to conventional practices can be achieved.

2 welding positions | **+** servo axes | **+2** welding positions (max. 8)

Version 3: B 20K-VC 1

All-in-one. Can be integrated in an existing machine or an existing production system. The B 20K-VC 1 combines welding control, machine and process control with all features of the B 20K and the VC 1 VariControl. Functions of both control platforms can be linked and exchanged with two-way communication as well as merged to form a single control system. All elements required for welding, production and assembly tasks are integrated to enable implementing a fully automatic production solution.

VC 1 | **+** servo axes | **+2** welding positions (max. 8)

1 inverter for all transformer sizes

70 to 220kVA

No modification
No replacement
Universal hardware base

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Welding system details

Welding profile

With simple menu navigation, preconfigured selection fields and graphical visualization, welding profiles can be created and customized easily and quickly.

Up to 25 different welding profiles can be used for each tool / welding task. Assignment of the corresponding welding profile is performed with the B 20K control functions. If several welds are performed with one welding station, there are different boundary conditions for each weld (such as different initial temperatures). For each boundary condition, a separate welding profile can be selected.

Each welding profile can be parameterized with up to 25 profile sections. Each profile section can be programmed individually with selection parameters for current or output, time and frequency. This allows for unlimited possibilities to manipulate and optimally adapt the welding process / welding task.

With the visualization features of the B 20K, information from the welding profile and the results of all measured process values (curve) can be seen in direct relation. Adaptation and optimization of the welding parameters can then be performed easily and quickly. All functions are combined in the control interface.

Measuring channels

The B 20K has 5 standard measuring channels for current [I], voltage [V], distance [mm], force [N] as well as an additional measuring channel. The sensors required for current and voltage measurements are standard for all B 20K systems. Sensors for distance and force are an optional expansion.

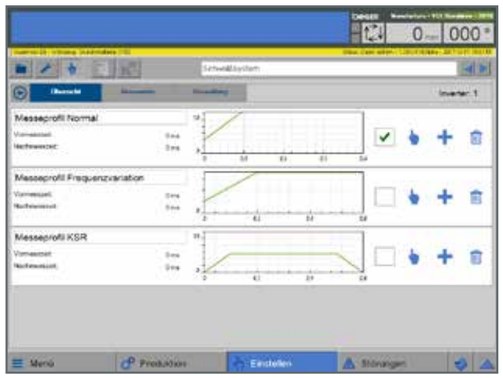
Current [I] and voltage [V] (standard)
The actual current and voltage values of the energy required for the welding process are recorded. All associated sensors are standard equipment of the B 20K system. For current measurement, sensors in the secondary circuit of the transformer are used. Voltage measurement takes place at the electrodes. The control system compares actual values and setpoint values and regulates deviations automatically.

Force [N] (sensors optional)
Force measurement is used to determine the electrode force. This allows for a simple, fast and reproducible electrode force adjustment. Deviations, changes and variations in the welding process are recorded and monitored.

Distance measurement (melt-down stroke, sensors optional)
The melt-down stroke measurement enables you to monitor distance changes before, during and after the welding process in the micrometer range. In addition to traditional measurements such as voltage and current, the distance can be associated directly with the welding quality.

Additional measuring channel (sensors optional)
There is also a pre-installed additional measuring channel to record values of an analog sensor (output voltage -10 – +10V) – for instance for temperature measurements using a pyrometer, thermal voltages or other heating process data.

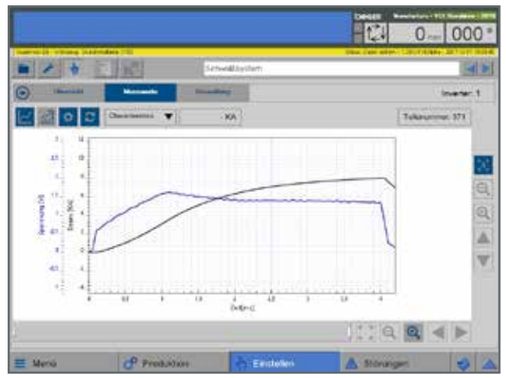
All measured values of each measuring channel can ensure a reliable welding process. All measured values can be monitored by default, used as a control variable and to identify rejected parts. Incorrect welds can be avoided and production with a very high level of good parts is guaranteed.



Overview welding programs

Welding profile with 4 sections and different frequencies

Measuring channel selection



Measuring curves of selected measuring channels

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New perspectives for
press and progressive technology

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Welding system details

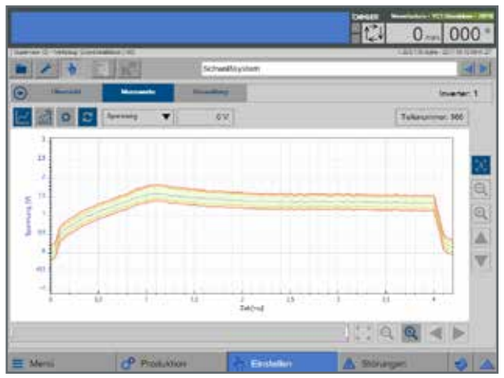
Open-loop and closed-loop control modes

Profile control with individually programmed welding profile

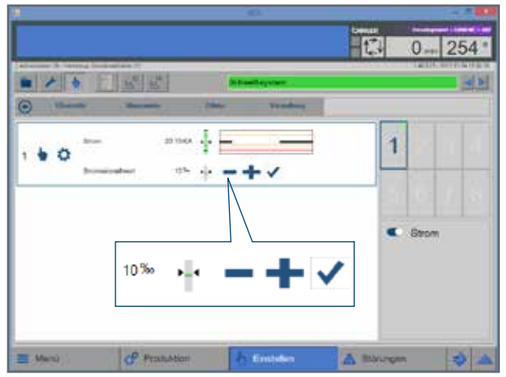
The created welding profile is used as setpoint curve. The welding profile can be based on the current profile [A] or the output profile [P].

Reference curve control with master curve after reference weld

The setpoint curve for this control mode can be easily and quickly established by creating a master curve from a reference weld with a good part. It can be selected whether the measuring curve of the current profile [A] or the output profile [P] of the reference weld is used.



Measuring channel selection



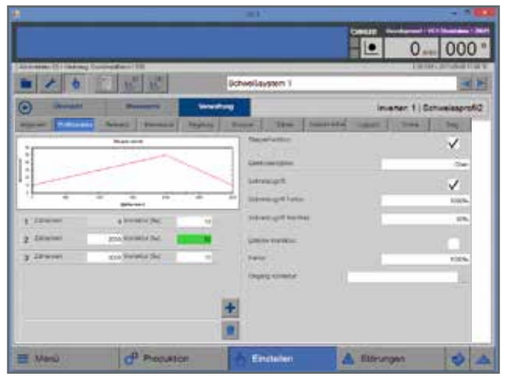
Quick online parameter adjustment for welding profile

Quick online parameter adjustment in automatic mode

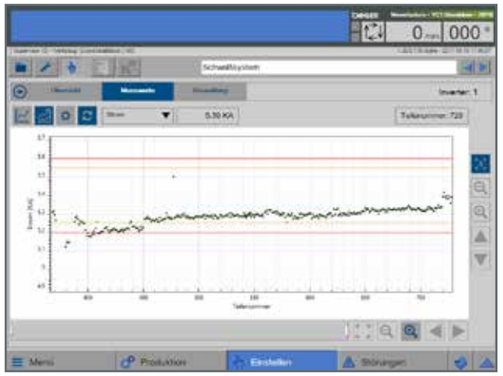
This control function is used, for instance, to quickly and easily implement welding parameter corrections in automatic mode. This is done by means of a comfortable and simple control function integrated in the customized B 20K operating panel. It is performed online without having to stop the machine, load programs etc., and enables the quick and easy identification of the correct welding parameter set for automated operation and drastically reduced adjustment times.

Stepper function for automatic current and output correction

With the stepper function, current or output values can be increased step-by-step or continuously when the number of welds increases. In step mode, the increase after each individual weld exactly follows a defined parameter value. In continuous mode, the increase is by a percentage value over the entire service life of the electrode. With this control function, negative effects such as changes of the contact resistance due to electrode wear can be counteracted to constantly achieve a high welding quality.



Stepper function



Data logging

Measuring channel-dependent control of parameter values

Welding parameters / welding profile are automatically customized and controlled depending on the measured values. Using the control functions, each measurement value signal can be assigned to an action for an intervention in the welding parameter set / welding profile. For instance, the melt-down stroke measurement can be used to automatically switch off current or output when a certain value is measured. Annealing applications can be equipped with an integrated temperature measuring system (additional measuring channel) to automatically adjust the initial output depending on the temperature conditions or automatically control the amount of time until reaching the target temperature.

The described open-loop and closed-loop control modes ensure that the optimum mode for the welding task is selected and help avoid rejected welds.

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Welding system details

Process monitoring

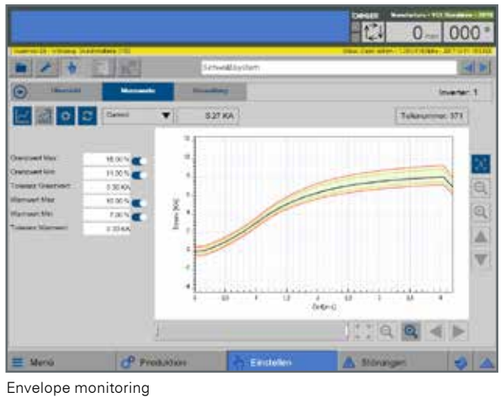
The B 20K provides various process monitoring functions and options. For each of the 5 measuring channels, the entire measuring curve as well as individual values in the curve can be monitored and used for different actions and reactions. This means rejected welds can be safely identified.

Universal process monitoring with envelope

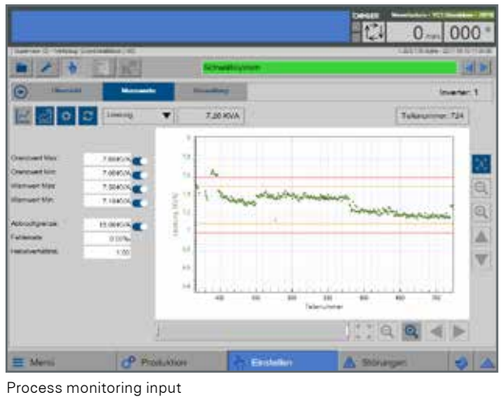
A tolerance band is automatically generated across the entire measuring curve of a reference weld (good part). The size of the tolerance band (+-) can be defined freely. Each measuring curve of successive welds is monitored to ensure compliance with the defined tolerance band.
Using the control functions, the envelope monitoring can be further customized. For instance, sections or areas from the measuring curve(s) can be selected and individual tolerance bands can be defined.

Process monitoring of measured values

By default, an individual measured value is created as a mean value for each measuring curve of a weld. For monitoring this individual measured value, the B 20K provides additional features that can be adapted quickly and easily. It is also possible to define absolute limits (min/max) and warning limits. Each measurement value of successive welds is monitored to ensure compliance with the defined limits.
The described process monitoring functions enable monitoring the welding process, drawing conclusions regarding the joining quality, using results as a control variable and/or recognizing faulty welds by comparison with the previously generated reference specimen. Thus, the number of manual test intervals can be reduced drastically.
Welds that have reached defined limits can be identified as rejected parts. When reaching / exceeding / falling below a limit value, the component is recognized as a rejected part. The identification can be used for various actions such as: warning, system stop, sorting good/rejected parts at the end of the machine (optional).



Envelope monitoring



Process monitoring input

Data export

The B 20K now offers a networking option with data transfer via an OPC-UA interface. It features online data acquisition of the results of each activated process monitoring function and each active measuring channel including data logging and mapping with further information to ensure traceability at part level.

Automatic data logging for welded components

The following values are saved after each welding task and exported by default:
- Parts counter
- Time and date
- Parts status (from process monitoring, e.g. rejected part, warning, etc.)
- Measured value (mean value from measuring curve for current, voltage, distance, …)

Automatic storage of measuring curves

When identifying a rejected weld, all associated measuring curves are logged and stored in the controller. This enables a precise analysis of the rejected part with all associated information. This function can be used to verify the last four rejected welds.

Backup

An automatic backup of all adjustment values such as welding profiles, control functions and monitoring functions is included in the software.

Cooling system

The cooling system permanently monitors operating state and flow rate / flow quantity in supply and drainage lines of the cooling unit (Sigma Series) as well as at the transformers. These are linked with the B 20K. Status changes in the cooling system are registered immediately and communicated to the B 20K. This ensures quick and convenient troubleshooting, since this control function provides information regarding the cooling system. Negative effects on the welding process by the cooling system are prevented.

Expandability

Expandability with process modules
- Contact welding devices
- Electrode wheel AgC
- Special welding tool

Welding technology service portfolio

Benefit from our broad range of customized services: from practice-oriented welding seminars, services of our welding laboratory and materials technology department, sample part production, design consultation and device development to fast and reliable Teleservice and reliable on-site support.


Design consultation


Welding laboratory


Device development


Training


Materials technology


Sample part production


Teleservice


On-site support

Transformer types	70 kVA, 130 kVA, 170 kVA, 220 kVA
Welding frequencies (transformer type)	10 kHz – 20 kHz (70 kVA), 1 kHz – 5 kHz (130 kVA, 170 kVA, 220 kVA)
Mains voltage range Three-phase current	230–480V for transformer with 70 and 130kVA 400–480V for transformer with 70, 130, 170 and 220kVA, 50/60Hz
Number of welding programs	25
Control method	Current profile control, output profile control, reference curve for current reference curve for output
Stepper function for open- / closed-loop control modes	No control, current profile control, output profile control
Measuring signal inputs (1) – (5)	(1) Current, (2) voltage, (3) force, (4) distance, (5) additional measuring channel (-10 – +10V)
Supply voltage U1	See above
Max. output Smax	250kVA at 400V
Rated power SN 33	Max. 230kVA at 50% ED / 400V dependent on transformer type
Welding current range I2	100–40,000A at 6% ED
Welding voltage U2N	7–14VDC (dependent on transformer type)
Interfaces, data backup / data exchange	ETHERNET, USB / OPC UA
Digital inputs / outputs	24VDC, rotary encoder (e.g. press)
Cooling water	8–35l/min at 25°C (dependent on transformer type)
Protection class	IP54
Maximum number of welding positions	8
Maximum number of servo axes	18

(Subject to change without notice 11/17)

Otto Bihler Maschinenfabrik GmbH & Co. KG
Lechbrucker Str. 15
87642 Halblech
GERMANY
Tel.: +49(0)8368/18-0
Fax: +49(0)8368/18-105
info@bihler.de

www.bihler.de